

## ENGINE CONTROL APPARATUS

### BACKGROUND OF THE INVENTION

The present invention relates to an engine control apparatus constituted such that, when a lock plate is disengaged from a stop switch knob, the stop switch is turned on to allow an engine of a small motorboat or the like to stop or to be in an idling state.

A small motorboat is made to glide over water while taking a sharp turn or jumping so that an operator can enjoy a ride.

This frequently causes the operator to fall into water. Due to this reason, it is required to, when the operator falls into water, stop the engine to prevent only the small motorboat from further progressing. Thus, a small motorboat is generally provided with a stop switch for allowing, when the operator falls into water, the engine to stop or to be in an idling state.

Specifically, a handle bar of the small motorboat is fixed with a switch case. The switch case has at a stop switch knob for activating a stop switch of an insertable resin-made lock plate that has at the base end a tightened wire. The tip end of the wire is fixed to the wrist or the like of the operator so that, when the operator falls into water, the lock plate is disengaged from the stop switch knob to turn on the stop switch, thereby allowing the engine of the small motorboat to stop or to be in an idling state.

As described above, the lock plate is inserted to the stop switch knob to allow the engine to start. This causes a situation where, when another lock plate of a small motorboat or a plate member having a similar shape is inserted, a third party can 5 start the engine without the owner's permission. In order to prevent such a situation where a boat is stolen, a conventional technique (as disclosed in Patent reference 1, for example) has suggested that a small motorboat having a control section in which a transponder incorporating an ID code is embedded in a 10 lock plate and inside the switch case an antenna that can receive the ID code so that the engine is controlled based on the received information.

The above conventional engine control apparatus is constituted such that the ID code of the transponder is 15 transmitted via radio transmission to the antenna and the received information is transmitted to the control section so that the engine is started only when a previously registered regular ID code and the received ID code coincide. When the former is different from the latter, the engine is not started. 20 This can start the small motorboat only when the regular lock plate is inserted to the stop switch knob and thus can prevent the boat from being stolen.

[Patent Reference 1]

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However, in the above conventional engine control apparatus, vibration of the engine mounted in the small motorboat always occurs when the engine is driven. This has created a risk in which the vibration is transmitted to the lock plate 5 to cause a defect in the inner transponder. Specifically, the transponder embedded in the lock plate causes the vibration transmitted to the lock plate to be directly transmitted to the transponder.

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#### SUMMARY OF THE INVENTION

The present invention is made in view of the above. It is an object of the present invention to provide an engine control apparatus in which the vibration of the engine is difficult to be transmitted to the transponder so that the transponder is 15 prevented from having a defect and the service life can be improved.

According to the invention of Aspect 1, an engine control apparatus, including: a stop switch body for allowing an engine to stop or to be in an idling state; a stop switch knob that 20 abuts with the stop switch body to activate the stop switch body to allow the engine to stop or to be in an idling state; a lock plate insertable to the stop switch knob; a transponder that is provided at the lock plate side and that can transmit a predetermined ID code; and a control section that can receive 25 the ID code transmitted from the transponder and that controls

the engine operation based on the ID code; wherein the engine control apparatus is characterized in that: when the lock plate is disengaged from the stop switch knob, the stop switch body is activated to allow the engine to stop or to be in an idling 5 state; and the transponder is provided separately from the lock plate and is attached to the lock plate or the vicinity thereof.

According to the invention of Aspect 2, in an engine control apparatus according to Aspect 1, the control section changes the engine performance based on the ID code from the transponder 10 and the transponder is detachably attached to the lock plate or the vicinity thereof.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view illustrating the engine control 15 apparatus for the small motorboat according to embodiment 1 of the present invention.

Fig. 2 is a right side view of Fig. 1.

Fig. 3 is a top view illustrating the lock plate and the attachment in the engine control apparatus for the small 20 motorboat according to embodiment 1 of the present invention.

Fig. 4 is a front view illustrating the attachment in the engine control apparatus for the small motorboat according to embodiment 1 of the present invention.

Fig. 5 is a top view illustrating the engine control 25 apparatus for the small motorboat according to embodiment 2 of

the present invention.

Fig. 6 is a right side view of Fig. 5.

Fig. 7 is a top view illustrating the lock plate and the attachment in the engine control apparatus for the small 5 motorboat according to embodiment 2 of the present invention.

Fig. 8 is a front view illustrating the attachment in the engine control apparatus for the small motorboat according to embodiment 2 of the present invention.

Fig. 9 is a top view illustrating the engine control 10 apparatus for the small motorboat according to embodiment 3 of the present invention.

Fig. 10 is a right side view of Fig. 9.

Fig. 11 is a top view illustrating the lock plate and the attachment in the engine control apparatus for the small 15 motorboat according to embodiment 3 of the present invention.

Fig. 12 is a top view illustrating the engine control apparatus for the small motorboat according to embodiment 4 of the present invention.

Fig. 13 is a right side view of Fig. 12.

20 Fig. 14 is a cross-sectional view taken at the line XIV-XIV in Fig. 13.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, embodiments of the present invention will 25 be specifically described with reference to the drawings.

As shown in Figs. 1 and 2, the engine control apparatus for the small motorboat according to embodiment 1 is provided in the resin-made switch case 1 fixed to the handle bar H of the small motorboat. The switch case 1 provides the start switch 5 knob 2, the stop switch knob 3, the stop switch body 6, and the control section 11. The reference numeral G in Fig. 1 denotes a grip that is grasped by an operator when the operator drives the boat.

The start switch knob 2 is used to start the engine of 10 the small motorboat. The knob is constituted such that, when the knob is pushed, then predetermined electrical conduction may be obtained to start the engine. The start switch knob 2 can be provided to the switch case 1 with an arbitrary position and inclination angle.

15 As shown in Fig. 2, the stop switch knob 3 is always biased by the spring 4 toward the direction adjacent to the surface of the switch case 1 (right direction in the same drawing). When the lock plate 5 (which will be described later) is inserted between the surface of the switch case 1 and the projection of 20 the stop switch knob 3 (as shown in the same drawing), then the base end of the stop switch knob 3 (right tip end in the same drawing) is separated from the stop switch body 6.

The stop switch body 6 is provided in the switch case 1 and is activated when abutting with the base end of the stop 25 switch knob 3 to allow the engine of the small motorboat to stop

or to be in an idling state. This allows, when the lock plate 5 is disengaged from the stop switch knob 3, the stop switch body 6 to activate to allow the engine of the small motorboat to be forcedly stopped or to be in an idling state.

5        The lock plate 5 includes a resin-made plate-like member and forms, as shown in Fig. 3, the notch 5a at one end in the plan view. The lock plate 5 also has at the substantial center two convex sections 5b and has at the other end of the plan view a hole 5c to which the wire 7 is inserted. The tip end of the  
10      wire 7 (not shown) is designed to be attached to the wrist or the like of an operator of the small motorboat.

When the notch 5a is engaged with or separated from the periphery side of the stop switch knob 3, the lock plate 5 can be inserted to the stop switch knob 3. This allows, when the  
15      operator falls into water, the lock plate 5 to be disengaged from the stop switch knob 3 via the wire 7. In the drawing, the reference numeral 8 denotes a circular ring-shaped metal fitting for inserting the tip end of the wire 7 to the hole 5c.

The two convex sections 5b formed at the lock plate 5 have  
20      a groove-like shape over the surface of the lock plate 5 to which the resin-made attachment 10 incorporating the transponder 9 can be attached. Specifically, this attachment 10 has at the lower face the clip section 10a as shown in Fig. 4. The attachment 10 is constituted such that, when the clip section 10a sandwiches  
25      the top and back face of the lock plate 5 (more specifically,

the space between the two convex sections 5b), the attachment 10 can be attached.

The transponder 9 is provided at the lock plate 5 side to hold a predetermined ID code and can transmit the ID code 5 from an antenna (not shown) via radio transmission. The ID code includes information for providing an arbitrary engine performance. The engine performance includes, for example, the engine performance for a beginner or one for an experienced user.

In this embodiment, the engine is first allowed to be in an idling 10 state when the lock plate 5 is engaged with the stop switch knob 3 to subsequently activate the start switch knob 2.

Specifically, the transponder 9 is incorporated in the attachment 10 but is separately provided from the lock plate 5. As a result, even when the engine vibration is transmitted 15 to the lock plate 5, the vibration can be absorbed between the lock plate 5 and the attachment 10 to a certain level and thus can be difficult to be transmitted to the transponder 9. This can prevent the transponder 9 from having a defect due to the vibration and the service life can be improved.

20 The control section 11 is provided in the vicinity of the stop switch body 6 in the switch case 1 and can receive an ID code transmitted from the transponder 9 and control, based on the ID code, the engine operation of the small motorboat.

25 Namely, a plurality of transponders 9 having various ID codes are prepared so that the operator can select an arbitrary

one to attach the selected one to the lock plate 5 thereby providing engine performance in accordance with the operator's preference.

In this way, this embodiment allows the control section 11 to change the engine performance based on the ID code from 5 the transponder 9 and allows the transponder 9 to be detachably attached to the lock plate 5. This allows the operator to easily exchange the transponder 9 according to the need. Specifically, the engine performance can be changed in accordance with the operator's preference in an easy manner.

10 Next, the engine control apparatus for the small motorboat according to embodiment 2 will be described. As shown in Figs. 5 and 6, the engine control apparatus for the small motorboat according to this embodiment is formed in the resin-made switch case 1 fixed to the handle bar H of the small motorboat. The 15 switch case 1 is provided with the start switch knob 2; the stop switch knob 3; the stop switch body 6; and the control section 11. Additionally, the same symbols are given according to the same components as those of embodiment 1, so a detailed description is omitted.

20 As shown in Fig. 7, the lock plate 5 according to this embodiment is formed with the rectangular concave section 5d having a depth in the direction of the thickness, and the communicating hole 5e extending from the concave section 5d in a left and right direction so that the attachment 12 incorporating 25 the transponder 9 can be attached thereto. Specifically, the

lower face of the attachment 12 has projection 12a that is provided in a protruded manner and that can be engaged with the concave section 5d. The projection section 12a has lateral hole 12b that is communicated with the communicating hole 5e in a state 5 of being engaged with the concave section 5d.

While the projection section 12a is engaged with the concave section 5d and the communicating hole 5e is communicated with the lateral hole 12b, the pin P (see Fig. 6) is inserted, thus allowing the attachment 13 to be attached to the lock plate 5.

10 On the other hand, a technique for changing engine performance by the control section 11 based on the ID code from the transponder 9 is the same as that of embodiment 1.

As in embodiment 1, the transponder 9 in this embodiment is included in attachment 10 but is provided separately from 15 the lock plate 5. As a result, even when the engine vibration is transmitted to the lock plate 5, the vibration can be absorbed between the lock plate 5 and the attachment 10 to a certain level and thus can be difficult to be transmitted to the transponder 9. This can prevent the transponder 9 from having a defect due 20 to vibration and the service life of the transponder 9 can be improved.

Further, the control section 11 changes the engine performance based on the ID code from the transponder 9 and the transponder 9 is detachably attached to the lock plate 5. 25 Therefore, this allows the operator to easily exchange the

transponder 9 according to need. Specifically, the engine performance can be changed in accordance with the operator's preference in an easy manner.

Next, the engine control apparatus for the small motorboat 5 according to embodiment 3 will be described. As shown in Figs. 9 and 10, the engine control apparatus for the small motorboat according to this embodiment is formed in the resin-made switch case 1 fixed to the handle bar H of the small motorboat. The switch case 1 is provided with the start switch knob 2, the stop 10 switch knob 3, the stop switch body 6, and the control section 11. Additionally, the same symbols are given according to the same components as those of embodiment 1 and embodiment 2, so a detailed description is omitted.

As shown in Fig. 11, the lower end of the lock plate 5 15 according to this embodiment has a pair of protruded sections t extending and separated by a predetermined interval. Each of the protruded sections t includes the penetrated hole 5f. The attachment 13 incorporating the transponder 9 also forms the protruded section s that is protruded to correspond to each 20 protruded section t. The respective protruded sections s also form the penetrated hole 13a.

While the protruded section t makes or is in the vicinity of the protruded sections s and each penetrated hole 5f is communicated with each penetrated hole 13a, the pin P (see Fig. 25 10) is passed through these holes. As a result, the attachment

13 is attached to the lock plate 5 and the attachment 13 is can be made pivotable around the pin P to the lock plate 5. It is noted that a technique for changing engine performance by the control section 11 based on the ID code from the transponder 5 9 is the same as that of embodiments 1 and 2.

According to this embodiment, as in embodiments 1 and 2, the transponder 9 in this embodiment is incorporated in the attachment 10 but is provided separately from the lock plate 5. As a result, even when the engine vibration is transmitted 10 to the lock plate 5, the vibration can be absorbed between the lock plate 5 and the attachment 10 to a certain level and thus can be difficult to be transmitted to the transponder 9. This can prevent the transponder 9 from having a defect due to vibration and the service life of the transponder 9 can be improved.

15 The control section 11 changes the engine performance based on the ID code from the transponder 9 and the transponder 9 is detachably attached to the lock plate 5, as described above. This allows the operator to easily exchange the transponder 9 according to need. Specifically, the engine performance can 20 be changed in accordance with the operator's preference in an easy manner.

Furthermore, the attachment 13 is can be made pivotable around the pin P to the lock plate 5. As a result, even when an excessive load is applied from the lock plate 5 side or the 25 wire 7 side, the excessive load can be released by the pivotal

movement and thus impact or the like can be difficult to be transmitted to the internal transponder 9, thus the service life of the transponder 9 can be improved.

Next, the engine control apparatus for the small motorboat  
5 according to embodiment 4 will be described. The engine control apparatus for the small motorboat according to this embodiment has the attachment 14 as shown in Figs. 12 and 13. The attachment 14 is attached by the wire 7 connected to the lock plate 5 (a circular part formed by the part metal fitting 8). As shown  
10 in Fig. 14, the transponder 9 is inserted into the inside.

According to this embodiment, the same as in embodiments 1, 2, and 3, the transponder 9 is incorporated in the attachment 10 but is provided separately from the lock plate 5. As a result, even when the engine vibration is transmitted to the lock plate  
15 5, the vibration can be absorbed between the lock plate 5 and the attachment 10 to a certain level and thus can be difficult to be transmitted to the transponder 9. This can prevent the transponder 9 from having a defect due to vibration and the service life of the transponder 9 can be improved.

20 The embodiment is described as in the above, however the present invention is not limited to this embodiment. For example, another structure may be used in which the transponder 9 is incorporated in the attachment 12 and the attachment 12 is provided separately from the lock plate 5. The attachment 12  
25 incorporating the transponder 9 may be attached at any position

in a range in which the transponder 9 and the control section 11 can communicate (i.e., in the vicinity of the lock plate 5).

Although this embodiment is applied to the small motorboat, this embodiment also may be applied to other machines (e.g., 5 ATVs or snowmobiles). The engine performance specification is not limited to the two types of one for a beginner and one for an experienced user. The engine performance also may be set for three or more levels, including one for racing, one for experienced users (high performance), one for general user 10 (cruise), one for beginners (course), and one for children (run), for example.

According to the invention of Aspect 1, the transponder is provided separately from the lock plate and the lock plate is provided in the vicinity of the transponder. Thus, the engine 15 vibration transmitted to the lock plate can be absorbed. As a result, the vibration can be difficult to be transmitted to the transponder. This can prevent the transponder from having a defect and the service life of the transponder can be improved.

According to the invention of Aspect 2, the control section 20 changes the engine performance based on the ID code from the transponder and the transponder is detachably attached to the lock plate or the vicinity thereof. This allows the operator to easily exchange the transponder according to need. Specifically, the engine performance can be changed in accordance 25 with the operator's preference in an easy manner.